

REMARKS

I. Introduction

This is in response to the Office Action dated March 5, 2002.

Submitted herewith is a petition under 37 CFR §1.136 and the required fee requesting a one month extension in which to file this Amendment. With the extension, this response is due on July 5, 2002.

No further extension of time is believed to be necessary for the filing of this Amendment, but if such an extension of time is required, applicants request that this be considered a petition therefor. The Commissioner is hereby authorized to charge any fees which may be required for such an extension to Deposit Account No. 11-1158.

In the March 5th Office Action, the Examiner objected to the "incorporation by reference" language which applicants used in the "Cross-Reference to Related Applications" paragraph included in the Preliminary Amendment filed on November 16, 2001. By the above amendment, this language has been deleted from this paragraph.

The Examiner also objected to the "Modified 1449 Form" which applicants submitted with their Information Disclosure Statement. Applicants have rerun the list of references with class/subclasses included for each listed U.S. patent and with a line at the bottom of each page for the Examiner's signature. To avoid referring to the list as a "modified" 1449 form, applicants have simply entitled it a "Listing Under 37 CFR §1.98(a)(1)."¹

Applicants apologize for any inconvenience which the original listing may have caused. If any further modifications to the title or content of the

¹ In preparing the revised list of references, applicants have deleted references which appear on the PTO 892 Form included with the March 5th Office Action.

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listing are needed or desired, the Examiner is requested to contact the undersigned and a further corrected list will be submitted.

II. The §102 Rejections

In the March 5th Office Action, the Examiner rejected applicants' pending claims under 35 USC §102 based on Kohli PCT Patent Publication No. WO 98/27019 (Kohli), Dumbaugh, Jr. et. al. U.S. Patent No. 5,374,595 (Dumbaugh), Moffatt et al., U.S. Patent No. 5,508,237 (Moffatt), and Nishizawa et al. U.S. Patent No. 5,801,109 and EP 714,862 (Nishizawa). More particularly, the Examiner cited Kohli and Nishizawa against all of applicants' pending claims (i.e., Claims 1-3, 5, 6, 8-16, 18-25, and 30-43) and cited Dumbaugh and Moffatt against Claims 30-43.² Applicants respectfully traverse these rejections.

To simplify the consideration of these rejections, the following discussion is in terms of the two independent claims of this application, i.e., Claims 1 and 30, it being understood that in so doing, applicants do not intend to imply that their dependent claims lack further distinctions from the references. For the convenience of the Examiner, Claims 1 and 30 are as follows:

Claim 1

1. An aluminosilicate glass exhibiting a density less than about 2.45 g/cm³ and a liquidus viscosity greater than about 200,000 poises, the glass consisting essentially of the following composition as calculated in mol percent on an oxide basis: 65-75 SiO₂, 7-13 Al₂O₃, 5-15 B₂O₃, 0-3 MgO, 5-15 CaO, 0-5 SrO, and essentially free of BaO, wherein the glass has a linear coefficient of thermal expansion (CTE) over the temperature range 0-300°C between 28-33 X 10⁻⁷/°C.

²Through what appears to be a typographical error, Claim 30 is not listed in the Office Action Summary (PTO-326 form) but is listed in the body of the Office Action, and thus has been treated as rejected. However, if there is an error in the Patent Office's claim summary chart, applicants request that it be corrected.

Claim 30

30. An aluminosilicate glass comprising in mol percent on an oxide basis: 65-75 SiO₂, 7-13 Al₂O₃, and 5-15 B₂O₃, wherein:

(a) said glass has a RO/Al₂O₃ ratio between 0.9 and 1.2, wherein R represents Mg, Ca, Sr, and Ba;

(b) the glass has a CaO concentration between 5 mol percent and 15 mol percent on an oxide basis; and

(c) the glass has a density less than about 2.45 gram/cm³, a liquidus viscosity greater than about 200,000 poises, and a linear coefficient of thermal expansion over the temperature range from 0°C to 300°C between $28 \times 10^{-7}/^{\circ}\text{C}$ and $33 \times 10^{-7}/^{\circ}\text{C}$.

Both of these claims are directed to glasses which contain silica, alumina, boric oxide, and calcium oxide as major constituents. As discussed in applicants' specification, the glasses of Claims 1 and 30 were developed for use as substrates for flat panel display devices, e.g., liquid crystal displays (LCDs).

Even more particularly, the glasses were developed for manufacture by the fusion process pioneered by Corning Incorporated, the assignee of this application. See, for example, page 2, lines 18-27, of applicants' specification. This process produces finished glass sheets which have pristine and essentially perfectly flat outer surfaces which do not require an extra polishing step before use as substrates in the manufacture of displays. The fusion process, however, is anything but forgiving and thus to a large extent, the glass has to be adapted to the process, rather than the other way around.

As a consequence of 1) their ultimate use and 2) their method of manufacture, the glasses of the invention must meet a variety of conflicting criteria.

On the use side, the glasses need to have a coefficient of thermal expansion (CTE) which, among other things, minimizes thermal stresses on the electronic components, e.g., thin film transistors, which are formed on glass substrates during the construction of flat panel displays. Also, because flat panel displays are typically used in portable devices, e.g., laptop computers, weight reduction is highly valued both by the display manufacturer and the ultimate consumer. For the glass substrates of a flat panel display, less weight requires less density for a given thickness and surface area.

On the manufacturing side, glasses which are to be made by the fusion process need to have high liquidus viscosities so that they can be formed into flat sheets without devitrifying and producing unacceptable levels of crystalline defects. More generally, a glass with a high liquidus viscosity gives the process a broader operating range which is of value in making wide sheets which exhibit low levels of both warp and internal stress.

In view of these use and manufacturing considerations, in addition to their compositional limitations, independent Claims 1 and 30 further include: 1) a CTE limitation, namely, a limitation that the CTE of the glass is in the range of $28-33 \times 10^{-7}/^{\circ}\text{C}$; 2) a density limitation, namely, a limitation that the density of the glass is less than about 2.45 grams/cm³; and 3) a liquidus viscosity limitation, namely, a limitation that the liquidus viscosity of the glass is greater than about 200,000 poise.

As the discussion to which we now turn shows, none of glasses disclosed in the Kohli, Dumbaugh, Moffatt, or Nishizawa references both

fall within applicants' compositional ranges and have applicants' required properties. Accordingly, applicants respectfully submit that these references do not anticipate their claims.

Beginning with the Kohli reference, the rejection based on this reference asserts that the examples of pages 9-11 of the reference anticipate all of applicants' claims. Those examples are in weight percent, while the claims of the present application are in mol percent. Attached as Exhibit B is a table which converts the weight percents of the Kohli reference to mol percents. The table also sets forth the CTE values reported in the Kohli reference, as well as RO/Al₂O₃ values calculated from the mol % values of the table.

From this table, it is evident that the Kohli examples do not teach the compositional limitations of applicants' independent Claims 1 and 30 since numerous of those examples are outside of applicants' ranges. As to the property limitations of applicants' claims, only Examples 8, 9, 10, and 14 have a CTE in the $28-33 \times 10^{-7}/^{\circ}\text{C}$ range called for by Claims 1 and 30.

During the prosecution of applicants' parent application Serial No. 09/443,260, applicants submitted a Declaration of Josef C. Lapp Under 37 C.F.R. §1.132 (the Original Lapp Declaration) which reported the results of experiments performed to determine the liquidus viscosity of Example 14 of the Kohli reference, i.e., one of the examples having a CTE in the $28-33 \times 10^{-7}/^{\circ}\text{C}$ range. As set forth in that declaration, Example 14 had a liquidus viscosity of 171,935 poises, i.e., substantially less than the lower limit on liquidus viscosity set forth in Claims 1 and 30.

Submitted herewith is a Supplement Declaration of Josef C. Lapp Under 37 C.F.R. §1.132 (Supplemental Lapp Declaration) which extends the work of the Original Lapp Declaration to include Examples 8, 9, and 10 of the Kohli reference, as well as Example 15 which of the remaining Kohli

examples has the closest CTE to applicants' claimed range. As reported in this declaration, Examples 8, 9, 10, and 15 of Kohli had liquidus viscosities in poise of less than 23,000, 30,000, less than 27,000 and 134,000, respectively, i.e., once again, the liquidus viscosities were substantially less than the value called for by applicants' claims.

In view of this data and the other distinctions discussed above, applicants respectfully submit that the Kohli reference does not anticipate their claims.

Turning to the Dumbaugh reference, in the March 5th Office Action, the Examiner rejected Claims 30-43 based on Tables IA and IIA of this reference. Again, the Dumbaugh reference does not teach applicants' compositional limitations since in numerous cases, Dumbaugh's glasses do not meet applicants' limitations, including their limitation on RO/Al₂O₃ ratios. As discussed at, for example, page 5, lines 8-14, of their specification, applicants have determined that RO/Al₂O₃ ratios in the 0.9 to 1.2 range called for by Claim 30 result in glasses which have high liquidus viscosities.

Moreover, when it comes to CTE values, the examples of the Dumbaugh reference are uniformly too high. The Dumbaugh reference reports a CTE value for each of its 51 examples. The lowest of those values is $34.6 \times 10^{-7}/^{\circ}\text{C}$ (Example 15). Applicants' Claim 30, on the other hand, has an upper limit on CTE of $33 \times 10^{-7}/^{\circ}\text{C}$. Plainly, in view of this difference between Dumbaugh's lowest value and applicants' highest allowed value, none of Dumbaugh's examples can be said to anticipate Claim 30.

The Moffatt patent, specifically, Tables I-IV, of that patent were also asserted to be an anticipation of Claims 30-43 in the March 5th Office Action. Again, the CTE's of the glasses of these examples are too high. Only 2 out of 42 examples, i.e., Examples 19 and 37, have CTE's in the

$33 \times 10^{-7}/^{\circ}\text{C}$ range, but these examples have very different compositions from those claimed by applicants.

Attached as Exhibit C is a table which converts the weight percent values for Examples 19 and 37 to mol percent values. The $\text{RO}/\text{Al}_2\text{O}_3$ ratios for these glasses are also reported in Table C. As can be seen in the table, Examples 19 and 37 differ from the compositional limitations of Claim 30 in numerous ways, e.g., the Al_2O_3 values for these examples are 15.1 and 14.7 mol percent, respectively, while the upper limit on Al_2O_3 in Claim 30 is 13 mol percent.

Accordingly, as with Dumbaugh and Kohli, applicants respectfully submit that Moffatt is not an anticipation of their claims.

Finally, Nishizawa also falls short of applicants' claimed invention. As set forth in, for example, the claims of the U.S. Nishizawa patent, the glasses of this reference are for use in a float process, not a fusion process. As such, Nishizawa's glasses have liquidus viscosities completely unrelated to those called for by independent Claims 1 and 30, i.e., instead of being greater than about 200,000 poise, the liquidus viscosities of the Nishizawa reference are all below 30,000 poise, i.e., more than six times lower.

In particular, Examples 5, 6, 9, 13, 15, 16, 17, and 21 of Nishizawa have liquidus temperatures which are the same as their 10^4 poise temperatures, i.e., the liquidus viscosity for these examples is 10,000 poise. The other examples have liquidus temperatures which are from 10°C to 60°C lower than their 10^4 poise temperatures. Thus, these examples will have liquidus viscosities somewhat higher than 10,000 poise. To determine just how much higher, Dr. Lapp performed the analysis reported in paragraphs 7 and 8 of his supplemental declaration submitted herewith. As discussed therein, the calculated liquidus viscosities for these other

examples are all less than 30,000 poise, the largest calculated value being 27,695 poises for Example 23.

Plainly, Nishizawa is concerned with glasses that are very different from the glasses which are the subject of applicants' claims. Accordingly, as with Kohli, Dumbaugh, and Moffatt, applicants believe that the Examiner's rejection based on Nishizawa should be withdrawn.

III. Terminal Disclaimer

In paragraph 7 of the Office Action, the Examiner entered an obvious type double patenting rejection with respect to commonly assigned U.S. Patent No. 6,060,168 to Jeffrey T. Kohli, one of the inventors of the present application. This U.S. patent corresponds to the Kohli reference discussed above (i.e., the U.S. patent corresponds to PCT Patent Publication No. WO 98/27019).

Applicants respectfully submit that the U.S. Kohli patent is not a proper basis for an obviousness type double patenting rejection in view of the substantial differences between the claims of this application and those that issued in the Kohli patent. As representative examples, the liquidus viscosity and CTE limitations of the claims of this application are much narrower than those of the Kohli patent, and all of the claims of this application contain a density limitation while the claims of the Kohli patent contain no such limitation. Also, the compositional limitations of Kohli are in weight percent, while those of the present application are in mol percent. Moreover, as discussed fully above, the claims of this application do not read on any of the examples of the Kohli patent. In view of these considerations, applicants believe that the double patenting rejection based on the U.S. Kohli patent should be withdrawn.

In paragraph 8 of the Office Action, the Examiner entered a second obvious type double patenting rejection, in this case based on U.S. Patent

No. 6,319,867 (the '867 patent), which issued from U.S. Application No. 09/443,260 from which this application claims priority.

Submitted herewith is a terminal disclaimer directed to the '867 patent. This terminal disclaimer is being made without prejudice and its sole purpose it to obviate the double patent rejection.

IV. Conclusion

In view of the foregoing, applicants believe that this application is now in condition for allowance. Accordingly, reconsideration and the issuance of a notice of allowance for the application are respectfully requested.

Respectfully submitted,

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